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No. 48 NOVEMBER 29th, 1958 Vol. 70

Registered for Transmission as a Newspaper *Price 2s. post free*

Abortion and Stillbirths in Pigs—An Analysis of 67 Outbreaks

BY

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SUMMARY.—The findings in an investigation into 67 cases of abortion and stillbirths in sows are described. In the majority no diagnosis was reached but an association with bacterial pathogens and with vitamin A deficiency was noted in a few. This preliminary survey serves to indicate some lines along which further work might proceed.

Purpose and Scope of Investigation

A SURVEY carried out by the Veterinary Investigation Service in England and Wales during 1955-6 into the incidence and causes of mortality in pigs showed a 4.8 per cent. incidence of stillbirths out of a total of 4,394 piglets born in 371 litters. The incidence of stillbirths varied widely in different herds from 0.4 to 12.9 per cent. These findings were in agreement with those reported from Northern Ireland by Gracey (1955) who found a stillbirth rate of 4.9 per cent. in 13,635 piglets born in 1,231 litters. The cultural examination of stillborn piglets threw but little light on the aetiology of the condition, for out of 194 batches examined in Investigation Centres during 1955 only 17 (10 per cent.) yielded organisms which might be considered of pathological significance.

During the same year (1955), 139 batches of aborted porcine foetuses were examined in Investigation Centres and evidence of infection was found in only 31 batches (22 per cent.). No explanation for the abortions could be offered in the other 108 cases.

The problems of abortion and stillbirth seemed of sufficient economic importance to warrant more detailed study and for this reason an investigation was carried out during 1956-7 from the Cambridge Veterinary Investigation Centre. During the 12-month period from November 1st, 1956, investigations were made in 67 herds in which the incidence of abortions or stillbirths was sufficiently serious that veterinary advice had been sought, and from which specimens had been submitted for examination to the laboratory. The results of this investigation are presented in this paper, and it is suggested that the work has clarified the position to the extent that avenues of approach are indicated which may be profitably followed in future work.

Materials and Methods

Detailed *post-mortem* examinations were made on all carcases of aborted and stillborn piglets. Smears were made routinely from stomach contents and from any other organ showing pathological changes and examined microscopically after staining by Gram.

Cultures were prepared from stomach contents, liver, heart-blood, and brain, on 5 per cent. sheep blood agar plates and incubated in 10 per cent. CO_2. A portion of placenta, where available, was inoculated into 20 ml. of Patchers's broth which, after incubation for 24 hours was plated on blood agar, to favour the recovery of the swine erysipelas organism. In the case of mummified or very small foetuses, the brain only was cultured.

The liver, where sufficiently well developed, was examined for its vitamin A content and small portions of liver, spleen, and kidney, were stored at −20° C. for reference.

Farm visits were made in almost all cases and data obtained on feeding and management. Blood samples (20 to 30 ml.) and vaginal swabs were taken from sows.

Classification of Outbreaks

The 67 cases encountered were divided into 3 main groups, A, B. and C, which were subdivided as

shown, the number of each being given in brackets:—

A. Abortion (28) 1. Multiple type (12)
2. Sporadic type (16) (a) Single case (8) (b) Sporadic cases occurring over a period (8)

B. Stillbirth (33) 1. Severe type (26)
2. Mild type (7)

C. Cases associated with infertility (6)

The groups are discussed in detail in the same order.

A. Abortion

1. Multiple Type

The 12 cases so classified were explosive in nature, abortion occurring in 2 or more sows over a short period of time.

The histogram (Fig. 1) shows that despite wide variation in their size, abortion in 8 of the herds was confined to 2 sows.

In 4 herds it was confined to gilts which were maintained separately from other breeding pigs on the premises.

On those farms where breeding sows and gilts ran together, gilts only were affected in 1 case and sows only in 5 others.

On 11 out of 12 farms the animals had access to pasture and on all the management was of good standard.

The stage of gestation at which abortion occurred was:—

Stage of gestation	6 wks.	8-12 wks.	11-13 wks.	13-15 wks.
Number of cases	1	3	6	2

The period 11 to 13 weeks accounts for half the cases, and the histogram (Fig. 2) illustrates the same tendency over the whole range of cases studied.

Results of Laboratory Examinations. Haemolytic coliforms occurred as a generalised infection in 9 out of 10 foetuses from one sow. These foetuses showed marked congestion of the kidneys with sub-capsular haemorrhages and also petechiae on the epicardium.

Non-haemolytic coliforms and *Staphylococcus aureus* also occurred as generalised infections and β-haemolytic streptococci were recovered from the amniotic fluid of an 8-week embryo. α-haemolytic streptococci were isolated from the stomach contents only of 3 foetuses; and 8 others were either sterile or organisms believed to be contaminants only were recovered.

Thus in 4 out of the 12 cases organisms were recovered in profuse, pure culture which appeared to be of some aetiological significance.

Vitamin A values within the normal range were found in all of the 20 foetal livers examined.

Examination of serum samples from aborted sows by the agglutination test using *Brucella abortus* antigen (Weybridge) was carried out.

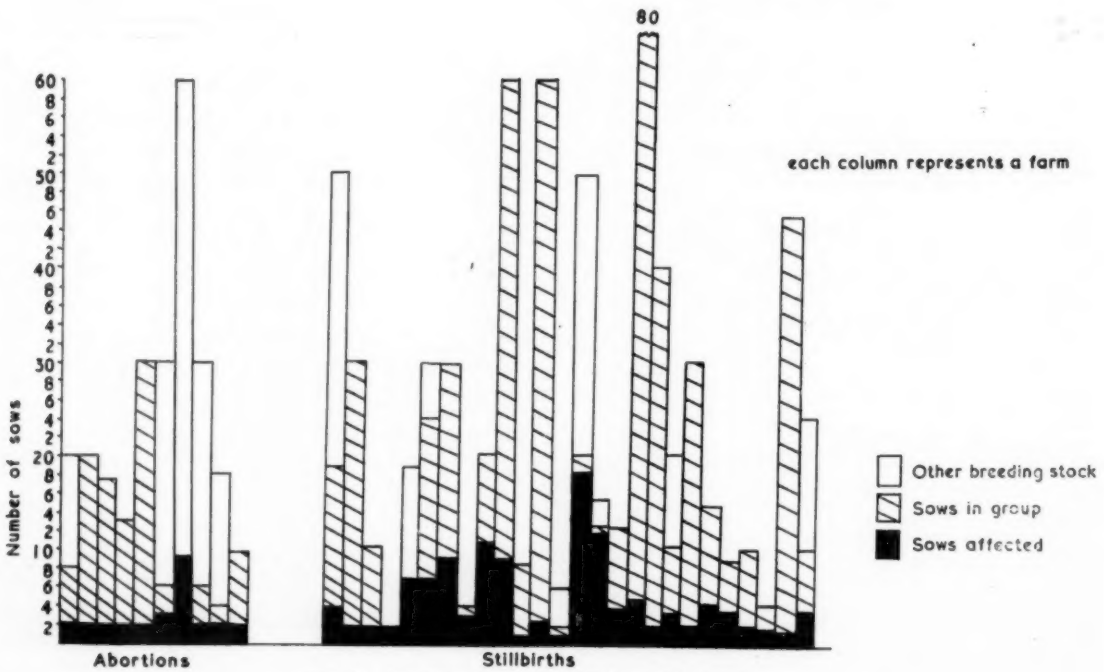

FIG. 2.—Number of sows affected on 36 farms.

The samples were also tested against 5 species of *Leptospira* (*ictero-haemorrhagiae, canicola, hyos, grippo-typhosa,* and *pomona*) by the complement fixation and dye tests for Toxoplasma and by the gel

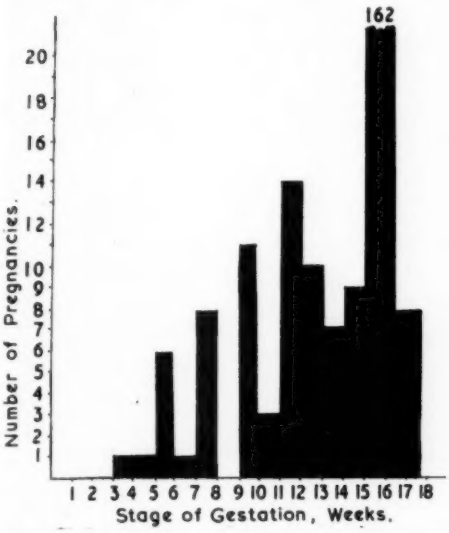

FIG. 2.—Stage of gestation at which Abortion/Stillbirth occurred in 241 pregnancies. The figure 162 indicates those ending at or about full term.

diffusion precipitin test against swine fever antigen. The results are summarised below:—

	Brucella	L. ict.	L. can.	L. hyos.
No. samples	20	19	19	19
No. Positive	0	0	1 at 1/100	0
No. Negative	20	19	18	19

			Toxoplasma		
	L. grip.	L. pom.	C.F.T.	D.T.	Swine F.
No. samples	19	19	17	17	17
No. Positive	0	0	0	0	2
No. Negative	19	19	17	17	15

The sample reacting against *L. canicola* was one of two taken from gilts 8 weeks after aborting, the other being negative.

Though it may be indicative of previous infection it seems unlikely that leptospiral infection was responsible for the abortion in these gilts. The samples positive for the gel precipitin test were in each case one of two, of which the second was negative. One herd was crystal-violet vaccinated and the other unvaccinated but in neither was there any history or evidence of swine fever.

2. Sporadic Type

(a) *Single Cases*

As implied in the classification this group concerned the single isolated abortion in herds with a previously good breeding history, and in which no further cases occurred in the subsequent months.

Eight cases are so classified, of which 3 concerned gilts and 5 sows.

The stage of gestation at which abortion occurred is shown:—

Stage of gestation	6 wks.	8 wks.	10 wks.	11 wks.	12 wks.	13 wks.
No. of cases	2	1	1	1	2	1

In 2 cases there was a history of recent transportation which was considered significant and in a third the dam suffered an undiagnosed illness at the time of abortion.

Results of Laboratory Examinations. Generalised infections with streptococci (mixed α- and β-haemolytic types), haemolytic coliforms, and non-haemolytic coliforms respectively, were found in the foetuses from 3 herds. The foetus from which the latter organisms were isolated showed gastro-enteritis, congestion of all the viscera, and haemorrhages on the epicardium.

In a case where no foetuses were available for examination *Staphylococcus aureus* was isolated in profuse culture from a vaginal swab.

Normal vitamin A values were found in the 3 foetal livers examined. The examination of 6 serum samples from aborted sows by the serological methods previously detailed gave negative results.

(b) *Sporadic Cases Occurring Over a Period*

The 8 herds grouped under this heading each had a history of sporadic abortions occurring over a period of months or even years.

There was no restriction of cases to single groups of breeding stock and all ages of animals were involved. The number of sows affected did not exceed 4 (1 farm), and on most farms (4) only 2 were involved.

Both early and late abortions or even stillbirths occurred on the same premises, the stage of gestation varying from 5 to 14 weeks on 4 farms and 12 weeks to term on the remaining 4.

In one case transportation appeared to be a precipitating factor, and in another hyperthermia associated with hot weather.

Results of Laboratory Examinations. The examination of 31 foetuses and one placenta resulted in the recovery of haemolytic coliforms from one batch of 9, the remainder yielding no significant organisms.

The examination of 23 foetal livers for vitamin A showed all but 2 to have values in the normal range. Since these were single foetuses little importance is attached to the levels found (19.8 and 11.4 I.U. per gramme) because of the wide variation found to exist within a litter.

The serological results are summarised:—

	Brucella	L. ict.	L. can.	L. hyos.
No. of samples	11	11	11	11
No. Positive	1 at 1/10*	—	—	—
No. Negative	10	11	11	11

			Toxoplasma		
	L. grip.	L. pom.	C.F.T.	D.T.	Swine F.
No. of samples	11	11	11	11	11
No. Positive	—	—	—	4 up to 1/40	—
No. Negative	11	11	11	7	11

*Equivalent to 20 Int. Units of brucella antibody per m.l. serum.

B. Stillbirths

The cases in which gestation ended in stillbirth were divided into 2 types:—

(1) *A severe type* in which the whole of a single litter or the major part of several litters within a short period were born dead about the time of full term.

(2) *A mild type* in which a minor part of several litters was born dead, the cases extending over a period of months.

1. Severe Type

Twenty-six outbreaks are considered in this category.

It is seen from the histogram (Fig. 1) that on 15 farms 2, 3, or 4 sows were involved, and in only 7 herds were more than 5 affected.

This observation has some importance in that the farmer can be given reassurance as to the probable extent of an outbreak when one or two of a batch of pregnant sows has given birth to stillborn piglets.

On 7 farms cases were confined to an isolated group of animals although there were other susceptible breeding pigs on the premises.

This finding also provides a guide to the probable extent of an outbreak which has already begun, and it may be of aetiological significance.

Gilts only were affected in 11 outbreaks and sows only in 9. Here again the tendency for groups, in this case age groups, to be affected is indicated.

All sizes of holding and many types of husbandry were represented but it is notable that in 11 out of the 26 cases, the sows had no access to grazing. Five cases of relative or complete deficiency of vitamin A featured in these 11.

Results of Laboratory Examinations. A feature of the bacteriological examination of 82 stillborn piglets was that no growth, or sparse growths of organisms judged to be contaminants only, was obtained in 72.

From the remainder, haemolytic and non-haemolytic coliforms and α-haemolytic streptococci were recovered, all of which were of doubtful importance.

These findings are in contrast to the abortion group, in which bacterial pathogens were isolated from roughly a quarter of the specimens.

Vitamin A. The livers of 60 stillborn piglets and of 1 gilt were examined for their vitamin A content.

In 3 outbreaks it was considered that avitaminosis A was the cause of stillbirths, as judged by the epidemiology and the total absence of vitamin A from the livers of several piglets.

In the most serious of these, 11 out of 12 gilts produced litters which were totally or partly stillborn and from which no piglets could be reared. The livers of 17 piglets and 1 from a gilt which died after parturition were examined and a trace only of vitamin A was detected in 5. The twelfth gilt, due to farrow 6 weeks later than the others, produced a normal litter having been put out to good grazing.

In all 3 cases of avitaminosis the animals affected were gilts which had been reared entirely indoors and had received little or no green fodder. The ration used was not supplemented with vitamin A.

The macroscopic appearance of the piglets was similar to that described by Goodwin and Jennings (1958), although one would not place undue reliance on anasarca as a diagnostic sign since this is frequently seen in aborted and stillborn piglets where vitamin A deficiency is not implicated. Enlargement, friability, and a blotchy appearance of the liver is probably more typical. Hydrocephalus and microphthalmia were also noted. The former is apparently uncommon in piglets but its experimental production by vitamin A deficient diets in other species is described by Miller (1956).

The assessment of the significance of vitamin A values is the subject of unending controversy. In this connexion the findings noted below illustrate that undue weight cannot be given to single estimations since considerable variation occurs between members of the same litter:—

Ref. No.	Specimens	Origin	Values I.U./gm.
12	6 stillborn piglets	1 litter	63·9 to 27·3
17	2 ,, ,,	,,	36·3 to 23·5
31	2 ,, ,,	,,	51·8 to 25·0
67	3 ,, ,,	,,	43·5 to 9·2

A similar variation was noted between the litters from sows under identical conditions of management one one premises. Averages of 80, 33, and 25 I.U. per gramme of liver were found in the stillborn litters of 3 such sows.

The results of serological examinations are summarised in the following table:—

	Brucella	L. ict.	L. can.	L. hyos.
No. of samples	92	87	87	87
No. Positive	7 up to* 1/20	—	—	—
No. Negative	85	87	87	87

			Toxoplasma		
	L. grip.	L. pom.	C.F.T.	D.T.	Swine F.
No. of samples	87	87	87	87	75
No. positive	—	—	—	17 up to 1/32	2 strong pos. 5-weak pos.
No. Negative	87	87	87	70	68

*Equivalent to 40 Int. Units brucella antibody per m.l. serum.

The positive reactions to the gel precipitin test for swine fever occurred in only a portion of the samples from each farm. There was no history or clinical evidence of the disease and the possibility that the effect on the foetus was the only manifestation of the presence of the virus is worthy of further investigation.

2. Mild Type

Seven cases are classed under this heading. In these a minor portion of several litters was born dead and the trouble extended over a period of months.

All were well-managed herds in which crystal-violet vaccination was routine, breeding stock had access to grazing, farrowing was supervised, and large litters were the rule.

The dead piglets were dispersed apparently at random in the sequence of birth, and were frequently the larger members of the litter.

Results of Laboratory Examination. Congenital abnormalities were seen from time to time in the piglets from one farm, but otherwise all the 21 examined showed no changes beyond slight general oedema.

Almost all were bacteriologically sterile and had normal vitamin A liver values.

The examination of 12 blood samples from sows by the methods previously described gave negative results.

Such uniformly negative findings tend to focus attention upon the mechanics of parturition as an explanation of these losses. The appearance of the piglets in many cases suggested a circulatory failure which in turn may have been consequent upon anoxia resulting from prolonged parturition. In this connexion the report of an experiment at the University of Missouri (Anon., 1957) concerning the administration of oxytocin for the speedy completion of farrowing is of interest and may have some practical application. The association with large litter size is noteworthy and in one herd at least agalactia was a complicating factor.

C. Cases Associated with Infertility

On 6 farms the principal breeding problem was infertility but abortions or stillbirths occurred, usually sporadically, within this syndrome. Sows were involved in all cases save an exceptional outbreak involving a batch of 14 gilts. In these, there was disturbance of the cycle and later apparent achievement of pregnancy followed by early abortion and resumption of cycles.

Some association with pasture oestrogens was suggested and removal to yards was followed by a return to normal cycles and fruitful pregnancies.

Results of Laboratory Examinations. Examination of a batch of foetuses from each case, comprising 15 specimens, resulted in the recovery of organisms of some significance from four batches.

These were *Staphylococcus aureus,* streptococci Group C, and Group E, and α-haemolytic streptococci.

In addition Group C streptococci were recovered from a vaginal swab of a sow which had aborted, and non-haemolytic coliforms in profuse, pure culture from vaginal swabs of temporarily infertile sows.

Vitamin A estimations on 9 foetal livers showed that all had values within the normal range.

The results of the serological examinations of samples from sows is summarised:—

	Brucella	L. ict.	L. can.	L. hyos.
No. of samples	21	14	14	14
No. Positive	1 at 1/10*	1 at 1/150	1 at 1/100	—
No. Negative	20	13	13	14

			Toxoplasma		
	L. grip.	L. pom.	C.F.T.	D.T.	Swine F.
No. of samples	14	14	18	18	13
No. Positive	—	—	—	10 up to 1/32	—
No. Negative	14	14	18	8	13

*Equivalent to 20 Int. Units brucella antibody per m.l. serum.

Discussion

The results of cultural and serological examinations suggest that some cases of abortion in sows may result from bacterial infection, and in this series pathogens were recovered from foetuses from 11 out of 34 farms. The isolation of potential pathogens from vaginal swabs also lends supporting evidence.

The opportunity did not occur for the recovery of such organisms from successive abortions on a premises, nor was there evidence of venereal spread. That such transmission may occur has been demonstrated by Fennestad *et al.* (1955) who implicated *Staphylococcus aureus* as a cause of infertility and abortion, and *Corynebacterium pyogenes* has been shown to be responsible for a herd outbreak in France (Goret & Joubert, 1955).

Leptospirosis is a well-recognised cause of abortion in several countries including Australia and America (Ferguson *et al.*, 1956; Powers *et al.*, 1956), and recently Michna (1958) has shown that it may occur more often in pigs in this country than hitherto suspected. His work raises the possibility that *L. pomona* may be present here.

The evidence in this series, represented by only moderate titres in a proportion of the affected sows, suggests previous incidental infection rather than active disease likely to be responsible for abortion.

Although the recovery of the swine erysipelas organism from aborted foetuses has been reported from time to time from Veterinary Investigation Centres it was never isolated in this series despite special cultural methods.

Serological examinations did not suggest infection with Brucella species, and in this connexion the results obtained by Doyle (1934) on testing 10,449 serum samples obtained from pigs at slaughterhouses are of interest. Four were positive at a titre of 1:100, 17 positive at 1:50, and 4 at 1:25. He failed to isolate Brucella from all the samples on guinea-pig inoculation. *Brucella suis* is a serious pathogen and abortifacient in many Continental countries and the

recent report (Pearse-Williams *et al.*, 1957) of its recovery from a child in Ireland indicates that vigilance should be exercised for its appearance here.

Toxoplasma infection has been described as a cause of abortion and stillbirths in America (Cole *et al.*, 1953). Dr. Cathie, of the Great Ormond Street Hospital for Sick Children, to whom we are indebted for the serological tests for Toxoplasma in this series, commented that in no case did the results indicate active infection. Moreover, in the 8 cases in which isolation of the organism was attempted by mouse inoculation of foetal organs, failure resulted.

Toxoplasma gondii is an organism which discriminates but little as to its host and is continually being encountered in fresh host species. It would be strange if the pig should prove to be an exception.

The gel diffusion precipitin test is now being used extensively for the detection of swine fever virus in tissue from suspected cases of the disease, and data as to its specificity and usefulness are rapidly accumulating. However, in this survey it was used for detection of antibody in serum and less is known about the specificity of the test when used in this way. It is not yet possible, therefore, to evaluate our findings. Abortion is frequently cited as the first manifestation of swine fever infection in breeding stock, and, if shown to be specific, this test should prove a useful diagnostic aid where the likelihood of such infection is suspected.

In the aetiology of stillbirths associated with vitamin A deficiency the presence or absence from the ration of vitamin supplements appeared to be of primary importance. Enquiries of 20 commercial pig food firms supplying farms included in this investigation elicited the information that 17 supplemented their rations for breeding stock with vitamin A throughout the year. One firm included it in the winter only and the remaining 2 did not incorporate vitamin supplements. The latter were each concerned in a case of avitaminosis A and a third case occurred where a home-compounded, non-supplemented ration was in use.

It is suggested that rations for breeding stock should be supplemented in summer as well as in winter, since it cannot be assumed that the stock, particularly gilts, will necessarily have access to pasture during the summer months.

Two other cases occurred in which circumstantial evidence suggested that feeding was responsible for stillbirths. In the first, a group of 4 gilts maintained on a high-protein experimental diet all failed to produce live litters while the control groups on a normal ration farrowed normally. Kvansitsky (1956) has shown that concentrated feeding of sows results in fewer maturing follicles and greater embryonic mortality than in relatively poorly fed sows.

The second case concerned a group of 20 gilts which suffered an abrupt change of ration from succulent feeding to dry, fibrous grazing late in pregnancy. Severe constipation resulted and 18 produced partially stillborn litters.

Enquiries were made in all cases concerning the possible operation of stress factors.

Recent transportation by road was noted in 5 cases, fighting between sows in 2, and concurrent, undiagnosed illness in one other. Physical exertion, as for example in negotiating deep mud, and injury from the attentions of the boar was also frequently cited and it is possible that all these factors acted as precipitating agents.

Although congenital defects were noted from time to time there was no evidence that hereditary factors were implicated in any case.

The study of abortions and stillbirths in sows is one which does not lend itself readily to experimental procedures. Much further work of a survey nature is required before the problem can be fully assessed and it is hoped that this preliminary review will provide a useful guide to such work.

Acknowledgments.—To Dr. I. A. B. Cathie, The Great Ormond St. Hospital for Sick Children for Toxoplasma serological tests; to Dr. Mansi and Dr. Slavin, of the Central Veterinary Laboratory, Weybridge, who carried out the gel diffusion precipitin tests and the Leptospira agglutination tests; to Dr. Parr, late of the Central Veterinary Laboratory, Weybridge, for the vitamin A estimations; to Miss Burn for technical assistance, and finally to Mr. H. I. Field, S.V.I.O., for his considerable help in the preparation of this paper.

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Tissue Vaccines in the Treatment of Bovine Papillomas

BY

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SUMMARY.—The use of a glycerol-saline growth suspension in the treatment of cattle with benign skin papillomas is described. In a 2-year period autogenous and non-autogenous vaccines were used for the inoculation of 233 cattle, 2 subcutaneous injections of 10 ml. and 15 ml. at a 14-day interval being recommended.

The results obtained on 197 cattle show that 87 per cent. of cattle with papillomas on the general body surface responded to autogenous vaccine, and 76 per cent. to non-autogenous vaccine. Teat wart vaccines were of value in only 4 out of 12 cattle treated. Bull penis growths disappeared after autogenous vaccination in 4 out of 5 cases. Uninoculated control cattle were kept on 15 farms where autogenous vaccines were used and showed virtually no change in skin tumour condition in a period during which vaccinated cattle showed regression of lesions. At the end of 2 years, 21 practices were using papilloma vaccines.

Reference is made to the use of papilloma vaccines in other parts of the world.

Introduction

ANGLEBERRY is the common term given to cattle warts or papillomas in Britain. The growths are well known to farmers and veterinarians and are very prevalent in bullocks and in other young stock. They vary greatly in size and numbers and can damage the hide considerably in many cases. Most frequently they are found on the head and neck area but may be present on any part of the body. Mechanically they are of great nuisance value and may obstruct breathing, feeding, handling or even the eyesight of the animal. The animal's growth may be retarded and many of the tumours acquire secondary bacterial infections. The teats of the cow are commonly affected and the fertility or service of a bull is not infrequently impaired owing to the presence of growths on the penis or sheath.

Terpstra (1947) found a virus to be the cause of papillomas in cattle and suggested the use of vaccines in giving animals immunity and the object of this paper is to record the results obtained following their use in Northern Ireland. Traction, ligation or surgery are not always practicable measures in dealing with skin papillomas and a method of preparing autogenous vaccines was devised at this laboratory with a view to studying their value under field conditions.

The use of vaccines in the treatment and prevention of cattle warts is not new. Commercial or autogenous vaccines are said to be used in practice in America (Finchner *et al.*, 1956) in the treatment of benign papillomas "with excellent results" and Olson, Segre and Skidmore (1954) state that papilloma vaccines have been available in the United States for many years.

Some hesitation in assessing the value of the vaccines is expressed as few workers have kept uninoculated controls; cumulative evidence, however, suggests that vaccines prepared from the tumour are of high prophylactic or curative value. Controls were kept by Rosenberger (1955), who obtained a very high percentage of success in preventing the condition. Biberstein and Sussenbach (1931) treated several cattle successfully with wart vaccine, while one uninoculated control animal died. Bagdonas and Olson (1954) and Olson, Segre and Skidmore (1954) used control groups in comparing wart tissue vaccine with chick embryo vaccine. They found the latter vaccine to be of little value in giving protection against a challenge inoculation, whereas tissue vaccine given to another group gave a high degree of protection. Stilinovac (1955) and Wunner and Zrenner (1956) add further weight to the importance of wart vaccines in treatment; the former inoculating 40 cattle, 8 horses and 2 dogs, and the latter, 40 cattle. Stilinovac gave 3 injections at 8-day intervals and his vaccines were both autogenous and heterologous. Wunner and Zrenner preferred autogenous vaccines, or at least a vaccine prepared from one of the animals in an affected group. Good results were obtained by both workers, though the former found that occasionally surgery was required in addition.

Shope's observations (1937) on the rabbit were a useful guide to the application of papilloma suspensions in cattle, but it is fairly clear that a number of different strains of papilloma virus exist. Segre, Olson and Hoerlein (1955) and Olson *et al.* (1954) have studied many strains from horses and cattle and found differences in strain pathogenicity and in their ability to produce neutralising antibodies. Cross-immunity experiments were carried out. McEntee (1950) has demonstrated that fibropapillomas of the bovine genitalia are caused by the same virus as the cutaneous type and differ from the latter only in morphology. Commercial vaccines do not appear to be of such high value as autogenous vaccines and thus indicate strain differences—even between papilloma viruses in the same species of animal.

In Jamaica (1953) two types of virus verruca have been found in cattle, one of which is transmitted by biting flies. Most types of cattle papilloma appear to be transmitted through wounds and among animals in contact with wire fences (Bagdonas & Olson, 1953). The incubation period was found by these workers to be 3½ to 4 months after contact.

Two of us in practice in Northern Ireland (T.S. and D.Mc.) commenced using vaccines in 1956 and by May, 1958, veterinary surgeons in 21 practices had become keenly interested in their use. By that time over 200 tissue vaccines had been issued and the results in most cases obtained.

Vaccine Preparation

Many skin tumours have mild contaminating infections and with a view to destroying these and preserving any virus present in the growth, glycerol-saline was selected for preparation of the vaccine in preference to formalin. Vaccine for a single animal is prepared as follows:—

1. Two to 5 g. of fresh active growth are cut into small pieces and ground by pestle and mortar with the same volume of sterile silver sand.
2. The ground material and sand are transferred to a boiling tube and 60 ml. 50 per cent. glycerol-saline thoroughly mixed with the material. The mixture is left to sit for 5 to 10 minutes to allow the sand to settle.
3. The supernatant fluid and particles are decanted off and bottled at room temperature for 2 to 3 days.
4. Two layers of fine butter muslin are used to filter the mixture into a further container and 25 ml. of particulate vaccine decanted after 5 to 10 minutes.

Method of Vaccination

An initial dose of 10 ml. is given subcutaneously, followed by a second injection of 15 ml. after 2 weeks if considered necessary.

Local Effect

It was unusual to find any irritant effect following this method of injection, but in 3 cases out of 200 animals inoculated a local connective tissue tumour developed after 2 to 3 weeks. It did not affect the epithelium and gradually diminished in size and disappeared entirely. Local pain was sometimes shown by the animal for an hour or two after injection, but massage of the inoculation area at the time appeared to lessen this.

Results

Over a 2-year period papilloma vaccine for 233 cattle was issued and the results for 197 obtained. Incomplete reports are not recorded in what follows as occasionally inoculated cattle were sold before results were seen.

During the first year of the trial, two of us (D. McC. & T. S.) kept rigidly to the two doses of 10 ml. and 15 ml., but it was clear that in many instances the second injection was not always necessary. Tumours in such cases appeared to lose their "lustre" even within the first fortnight. Smaller growths had partially dried up as if their blood supply was being constricted. This latter point was in fact proved by removing one or two of the growths at various stages following inoculation and such a finding was indeed a good indication of the response following vaccination. Considerable haemorrhage sometimes followed the removal of small warts for vaccine preparation whereas 14 days after vaccination little bleeding occurred. In 3 to 4 weeks smaller growths could be rubbed off quite easily but larger ones would take a further week or two before falling off.

The type of papilloma treated appeared to influence the result.

Large cauliflower growths were on the whole slow to respond and sometimes took several months to clear. Early evidence of response, however, was shown by the removal of smaller growths from such animals and noting the effect of their blood supply. Indeed the constriction of blood supply was of considerable advantage in very bad cases where the owner was impatient for results as surgical removal of larger growths could be carried out with greater safety. Growths with a broad base naturally took a little longer to clear than those with pedunculated or narrow skin connexions.

Teat warts were not very satisfactory and their vaccines gave poor results. Only 12 teat-wart vaccines were prepared and there was little or no response shown to 8 of them. This may have been due to the fact that little virus was present in the growth specimens owing to their hard horny nature.

Tumours on the penis and sheath of bulls were treated on 5 occasions, 4 with complete success and 1 with response only after 12 to 14 weeks. This last case was quite remarkable. The bull received 6 inoculations of an autogenous vaccine and at the site of the first 2 injections it developed connective tissue tumours which did not persist. The possibility of the growth being malignant was considered but histologically it proved to be a benign papilloma. In contrast to this another bull had a mass of lesions on the penis and sheath and according to the practitioner it showed a "miraculous improvement" 14 days after inoculation.

In the second year of the trial non-autogenous stock vaccines were brought into use and the efficiency did not appear to be much lower. It was more convenient to inoculate an animal with stock vaccine at a first visit and reinoculate it with autogenous vaccine later on. The effect of stock vaccine (prepared from papilloma growths from 3 to 4 animals on different farms) was thus seen at the second visit and in 2 or 3 practices stock vaccine is now more commonly used.

The overal results are summarised in tabular form overleaf.

Discussion

The desirability of keeping uninoculated control animals has been very apparent to us in this trial, but it was not easy to do so where many animals presented for treatment were single cases. Never-

	Total	Success	Failures
General body surface warts (autogenous)	122	106 (87%)	16 (13%)
General body surface warts (non-autogenous)	58	44 (76%)	14 (24%)
Teat warts	12	4	8
Bull penis and sheath warts	5	4	1

197 cattle treated, 139 with autogenous vaccine and 58 with non-autogenous stock vaccine.

theless every effort was made to keep a number of controls on farms where 2 or more cattle were affected and we were able to do so on 15 farms. Twenty-six animals were vaccinated and 19 left untreated for a period of 4 to 6 weeks: only one control animal showed any degree of regression of lesions, whereas 23 of the vaccinated group showed complete or almost complete clearance of growths by the sixth week.

The actual removal of small papillomas for preparation of the vaccine might be considered to have contributed to resolution, but this only rarely appeared to be the case. Frequently it was 2 weeks before first vaccine inoculations were given after removal of the wart taken for vaccine preparation, but no regression of the lesions was found. Following vaccine therapy the growths on the animal usually showed signs of losing their " lustre " in 2 to 3 weeks. Roberts (1953) employed manual traction of a few small warts as a means of dealing with the condition, but did not expect general improvement for 2 to 3 months. Finchner *et al.* (1956) occasionally found the remaining warts shrinking and dropping off after the removal of a large one 1 to 2 months previously, but they by no means favoured this method of therapy if vaccines could be employed.

It is not clear why removal of specimen warts may lead occasionally to regression of the others on the body but it is possible that surgical removal is in itself a minor form of vaccination. Some virus is likely to be released into the circulation, and this in some cases may be sufficient to initiate an immunising process.

Spontaneous recovery without any surgical or vaccine interference is not uncommon but many months will normally elapse before the skin is clear of growths. Olson *et al.* (1954) refer to this phenomenon and it has been observed by the writers. When animals are put to grass in spring, complete or partial clearing of growths may follow. Terpstra (1947) has also recorded this.

Although non-autogenous vaccines were not found to be quite so useful as autogenous vaccines in this trial, the reason for this occasional vaccine inefficiency does not appear to lie solely in a difference between virus strains. In a number of specific cases, autogenous vaccines failed to promote any resolution at all; *e.g.* for a bull with penis papilloma, vaccine was prepared from new warts on 2 occasions and 6 injections were given over a period of 3 months without effect. Other unsuccessful cases receiving fewer injections can also be singled out.

Warts on teats were remarkably resistant to treatment with autogenous vaccines—perhaps in part due to the type of tumour present and to the fact that little emulsifiable tissue could be obtained for vaccine preparation. If such warts were sent by post to the laboratory it was not only difficult to reconstitute the material, but it was thought unlikely that sufficient living virus was present for the production of an efficient vaccine. Indeed any delay in sending tumour material from other skin cases was considered to be an important disadvantage because of loss of virus viability.

Similarly, papillomas grossly infected with secondary bacterial infections were considered unsuitable for vaccine preparation and were frequently discarded and fresher material was asked for.

No growth was, of course, free from some form of skin contamination, hence our preference for glycerol saline for vaccine preparation. Minor bacterial infections were readily suppressed and any virus in the tissue suspension was preserved. In addition it was considered likely that the presumed presence of living virus in the vaccine would stimulate a more active immunity than formolised material. Few adverse effects have followed the use of the glycerol-saline vaccine in the 200 cattle inoculated, but there is obviously room for much scientific study of papilloma vaccines in the United Kingdom both in prevention and treatment.

The increased use and popularity of the vaccine during the second year of the above investigation is in itself significant, and vaccination is now being extended over a much wider area and to animals other than bovine.

Acknowledgments.—To Mr. T. D. Beattie for his technical help in the preparation of vaccines and to all veterinary surgeons who employed the vaccines experimentally and reported the results of their use.

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News and Comment

ROYAL COLLEGE OF VETERINARY SURGEONS TRUST

We understand that the Pig Industry Development Authority has informed the R.C.V.S. Trust of its intention to award, through the Trust, at least one Fellowship annually of a value of £1,500 to be designated "PIDA Senior Fellowships for Research in Pig Health."

The profession will be exceedingly grateful for this very handsome gift towards veterinary research in a field which is of constantly increasing importance.

CONFERENCE ON THE SCIENTIFIC PRINCIPLES OF FEEDING FARM LIVESTOCK

This conference, which was inspired by Sir Richard Haddon, was organised by a committee largely composed of scientists engaged upon nutritional problems connected with animals, under the chairmanship of Dr. D. P. Cuthbertson. The conference was held at Brighton and lasted 2½ days on November 11th, 12th and 13th. Those attending the conference stayed in two hotels thereby permitting considerable informal and valuable discussion to take place in the evenings and over meals.

The first session was devoted to the discussion of the following papers on cattle: "Calves (Dairy and Beef)" by Dr. J. H. B. Roy of the National Institute for Research in Dairying; "Beef Cattle" by Dr. T. L. Dodsworth of the North of Scotland College of Agriculture, and "Dairy Cows" by Dr. K. L. Blaxter of the Hannah Dairy Research Institute. Professor Alex Robertson of the Royal (Dick) Veterinary School of Edinburgh, who presided over the discussions on calves and beef cattle emphasised the fact that the "safe allowances" referred to by many speakers were not the same as the optimum allowances of food, for the food requirements of an animal can be affected by the previous state of its nutrition. More research was required into animal and environmental factors which can cause food requirements to vary. For example, some of the extraordinary variation in the results of work on calves might be due to subclinical disease, and veterinarians should be consulted when animal experiments were being planned. Many speakers urged farmers to use crushes and weigh bridges so that they would know more definitely what was the rate of growth of their cattle. Dr. Blaxter suggested abandoning average requirements standards in place of levels of minimum requirements, with an adequate safety margin. He felt it would pay farmers to spend more on the food of their high yielding cows and less on their poor yielders. Blaxter thought "steaming up" and adequate food in the early part of lactation to be very important in securing good yields later. With this Professor Holmes of Wye agreed. Several speakers emphasised the importance of appetite in cattle feeding and referred to the adverse effect of bulk on appetite. Blaxter suggested the protein requirements were slightly higher when less concentrated food is given. As Dr. Smith of the Hannah pointed out in his summing up of the discussions of dairy cattle, they were mainly concerned with appetite, protein, mineral and energy requirements.

Dr. A. T. Phillipson of the Rowett Research Institute read a paper on sheep in which he emphasised the need for more research on the nutrition of sheep, particularly in connection with pregnancy and lactation, including the increasing numbers of multiple pregnancies. Dr. Frazer was not happy about applying the more fundamental work on nutrition to sheep on the hills. Little was known also about the effect of variations in diet upon wool growth.

In the session on pigs, Dr. G. A. Lodge and Mr. I. A. M. Lucas of the Rowett read papers on "Breeding and Rearing Pigs" and Dr. R. Braude of the N.I.R.D. gave a paper on "Feeding Standards for Growing and Fattening Pigs." In these papers present knowledge was very well summarised. It was emphasised that the application of basic nutritional knowledge must be made against the background of the differing systems of management. Despite differing views Dr. Braude stated categorically that in his view the deposition of fat in the pig carcase was a misuse of feed. He was unhappy about our present knowledge of pig nutrition and emphasised the need for more research. He drew attention to the growing knowledge on the requirements of the pig for amino-acids and pointed out that the right balance of these acids was much more important than the undefined concentration of protein. He also mentioned that in trials in which he had permitted litter mates to have water *ad lib.* he found their water intake had varied by as much as seven to one.

In the session on poultry Dr. J. Duckworth of the Rowett presented a paper on "Rearing and Table Poultry" and Dr. W. Bolton from the A.R.C. Poultry Research Centre in Edinburgh gave one on "Laying and Breeding Fowls and Turkeys." As Mr. H. C. H. Graves said in summing up the discussion, all seemed to agree upon the importance of relating energy and protein intakes rather than relying on protein percentages alone. As much priority as possible should be given to those aspects of research which are likely to produce the largest economic benefits as, for example, the need for further knowledge of the poultry requirements for the amino-acids—lysine, methionine and cystine. Dr. R. F. Gordon made a brief reference to certain adverse effects which might follow the addition of antibiotics to poultry foods and Dr. McKay drew attention to the effect of zinc on weak hocks.

In summing up the whole conference Dr. Cuthbertson said all seemed agreed that there was a great need for more research on the feeding of farm livestock but that this research was hindered by the absence of agreed international units and standards.

The conference agreed to ask the A.R.C. to set up a new standing committee to review research work on animal nutrition and to consider periodically the literature on nutrition and feeding standards and to make the results of such reviews available to all interested bodies. Further conferences of a similar nature might also be convened from time to time.

W. R. W.

GRANT TO THE R.S.M. LIBRARY

The Rockefeller Foundation have made a grant of £24,000 to the Royal Society of Medicine to help the Society maintain their medical library over the next 5 years while substantial endowments are sought to guarantee its future maintenance and development.

The third quarterly report of the Foundation describes the Royal Society of Medicine as a private organisation providing extensive services to their 10,000 members and fellows and "a focus of intellectual activity in British medicine."

The service provided by the Society's library is stated to be essential to research in Britain. The library contains nearly 400,000 volumes and is used by more than 60,000 readers yearly. It is recognised as being one of the most comprehensive scientific libraries in the world.

THE BENJAMIN WARD RICHARDSON MEMORIAL LECTURE

This annual lecture, under the auspices of the Royal Society of Health, will be delivered this year by Mr. L. B. A. Grace, M.R.C.V.S., D.V.S.M., F.R.S.H., Chief Technical Adviser on Meat Inspection to the Ministry of Agriculture. The Chairman will be Dr. E. Hughes. Anyone who wishes to attend is asked to write to the Secretary of the Royal Society of Health, 90 Buckingham Palace Road, London, S.W.1. The date and time of the lecture are December 10th, at 2.30 p.m. in the Society's Headquarters as above.

THE COLONIAL VETERINARY SERVICE

Promotions: P. W. Swire, Senior Veterinary Officer, Kaduna, Northern Nigeria, becomes Principal Veterinary Officer, Kaduna, Northern Nigeria. A. Taylor, M.B.E., Veterinary Officer, Uganda, becomes Senior Veterinary Officer, Uganda.

New appointments: J. E. Anthony, M.R.C.V.S. (Calcutta University), Veterinary Officer, Western Region, Nigeria; M. P. Cunningham, M.R.C.V.S. (Glasgow University), Veterinary Research Officer, E.A.T.R.O. (East African Trypanosomiasis Research Organisation, Tororo, Uganda), East Africa High Commission.

APPOINTING A VETERINARY SURGEON IN 1848

We are indebted to a correspondent for sending us the following historical note which appeared in *The Northern Times*, and is reprinted by kind permission of the Editor of that journal.

In December, 1848, the Sutherland Farmers' Club were concerned about a rumour that "the disease of glanders had appeared and still prevails in horses in Easter Ross." They decided to investigate.

Mr. Hill, Golspie, told the meeting that one of the mail coach drivers had said that horses belonging to Mrs. Ellison, Tain, were infected with the disease, and that one of the horses belonging to Mr. Kinghorn at Ardgay, "who horses the next stage to Mrs. Ellison's" had caught the disease and that it was necessary to shoot the animal.

Mr. Rodford, mail coach inspector, had given instructions that "the poles and pole chains of the mail when arriving at Ardgay from Tain shall on every occasion be washed with lime water to prevent the spread of the infection."

The club appointed a committee to represent them at a meeting with Easter Ross farmers. The fact that at the time there was no veterinary surgeon in Sutherland gave further concern.

So it was decided on December 30th of that year to employ a properly qualified veterinary surgeon "to set the minds of the public at rest" as to the truth or falsehood of the glanders story. Another "strong reason" for providing a veterinary surgeon was that Sutherland farmers could not avail themselves of the advantages of insuring their stock "for want of a properly qualified person to act as inspector and who must be a veterinary surgeon residing in the county."

In the event, however, evidence was forthcoming that the glanders story was false. But for all that the club asked Professor Dick of Edinburgh, if he would once again "do them the favour to recommend a sober, active young man to settle here as veterinary surgeon."

The letter to Professor Dick continued, "As to emoluments, it is believed that such a man would soon command a good business in the way of his profession as no veterinary surgeon resides in the county at present. He might also do a good trade in horse-shoeing if capable of taking the management of a shoeing forge and if he could train young horses for saddle and harness, etc., it would be an additional recommendation, besides being of considerable advantage to himself.

"This profession would also qualify him for acting as inspector for a stock insurance company, and the members of the club will exert themselves to find suitable accommodation for him."

The next step in the matter was a letter to a Mr. George Knox, a veterinary surgeon in Edinburgh, asking him to submit his letters of recommendation for consideration.

He was offered a contract for one year and the sum of £15 sterling. "Mr. Gunn stated that he would add £5 thereto from the Duke of Sutherland, besides which grazing for his horse at Dunrobin." But Mr. Knox, who had travelled to Sutherland for an interview, refused "to accept of such terms unless the club would agree to his going every third week to practice his profession in Caithness." But the club considered this "inadmissible" and the secretary was instructed to pay Mr. Knox's expenses to and from the county.

The club eventually agreed "to encourage Donald Macleod, blacksmith, Golspie, to go to Edinburgh to attend practice under Professor Dick and promised to pay a portion of his expenses (£5). As it is desirable that Donald Macleod should acquire further insight in the profession the committee recommend that the club shall pay him a further sum of £5, provided he will attend next winter or spring, Dr. Dick's lectures and practice at the season of the year which the secretary shall ascertain to be most suitable."

R.S.H. CONGRESS, 1959

The President of the Veterinary Hygiene Section this year will be Mr. W. Tweed, F.R.C.V.S., D.V.S.M., Divisional Veterinary Officer, Ministry of Agriculture. The papers to be read are as follows: "Bovine Tuberculosis; the End in Sight." By Mr. J. N. Ritchie, C.B., B.SC., F.R.C.V.S., D.V.S.M., F.R.S.E., Chief Veterinary Officer, Ministry of Agriculture, and "The Slaughterhouses Act, 1958," by Mr. Philip B. Dingle, C.B.E., LL.M., Town Clerk, Manchester.

PRESENTATION TO MAJOR J. J. DUNLOP

At their Council Meeting held on November 20th, the Society of Practising Veterinary Surgeons presented a wristlet watch to Major J. J. Dunlop, M.C., M.R.C.V.S., D.V.S.M., in recognition of his past services to the Society.

PERSONAL

Mr. J. R. B. Hepburn has been appointed Veterinary Officer and has taken up station at Exeter.

Marriages

LITTLE—MCGEE.—On November 15th, 1958, at Guildford, Neil Roy Forster Little, B.VET.MED., M.R.C.V.S., of Reigate, to Marian Jill McGee, of Guildford.

STEAR—RUMPH.—At Thurlestone on November 14th, Robert Thomas Stear, M.R.C.V.S., Kingsbridge, Devon, to Anne Florence Rumph, Thurlestone, Devon.

COMING EVENTS

December

2nd (Tues.). Meeting of the Lakeland Veterinary Association at the George Hotel, Keswick, 6 p.m.

3rd (Wed.). Meeting of the B.S.A.V.A. Midland Area at the Midland Hotel, Derby, 1.30 p.m.

Annual General Meeting of the Scottish Branch at the Glasgow University Veterinary Hospital, 2.30 p.m.

General Meeting of the Society of Practising Veterinary Surgeons at the Glasgow University Hospital in conjunction with the Scottish Branch, 2.30 p.m.

4th (Thurs.). Ordinary Meeting of the Ayrshire Veterinary Association in the Ailsa Lounge, The Station Hotel, Ayr, 2.30 p.m.

Meeting of the Southern Counties Veterinary Society at the Polygon Hotel, Southampton, 8 p.m.

Autumn Meeting of the Dumfries and Galloway Division at the Creebridge Hotel, Newton Stewart, 2.15 p.m.

General Meeting of the Central Veterinary Society at the Royal Veterinary College, 6 p.m.

5th (Fri.). General Meeting of the Lincolnshire and District Division at the Grand Hotel, Peterborough, 2.15 p.m.

General Meeting of the Lincolnshire and District Division at the Grand Hotel, Peterborough, 2.15 p.m.

General Meeting of the South Wales Division at the Park Hotel, Cardiff, 2.30 p.m.

6th (Sat.) Annual General Meeting of the B.S.A.V.A. Southern Region at the Royal Hotel, Winchester, 7.30 p.m.

10th (Wed.) A General Meeting of the South-East Midlands Veterinary Medical Association at Franklin's Gardens Hotel, Northampton, 7.30 p.m.

Meeting of the A.V.T. and R.W's Scottish Regional Group in the Pathology Lecture Theatre, Royal (Dick) School of Veterinary Studies, Edinburgh, 2.15 p.m.

11th (Thurs.) Meeting of the West of Scotland Division in the University Veterinary School, 83 Buccleuch Street, Glasgow, C.3.

12th (Fri.) Annual Dinner-Dance of the North of England Veterinary Medical Association in the Three Tuns Hotel, Durham, 7.30 p.m.

General Meeting of the Midland Counties Veterinary Association at the Birmingham Medical Institute, 36 Harborne Road, Birmingham, 15.

Meeting of the Shropshire Veterinary Club at the Oak Hotel, Shelton, Shrewsbury, 8 p.m.

18th (Thurs.) Dinner-Dance of the Dumfries and Galloway Division, V.V.B.F. Ladies' Guild in the County Hotel, Dumfries, 8 p.m.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Warwicks. Rose Cottage Farm, Burthurst Lane, Stretton-on Dunsmore, Rugby (Nov. 21).

Wigtown. Hillfield, California Farmlands, Whithorn, Newton Stewart (Nov. 18).

Fowl Pest

Hereford. Jenningsbury Farm, London Road, Hertford (Nov. 24).

Kent. The Copt Farm, Mount Le Hoe, Benenden, Cranbrook (Nov. 18).

Lincs. Green Farm, Hougham, Grantham (Nov. 23).

Norfolk. Woodrose Farm, Deopham, Wymondham: The Kennels, Oakley Park, Diss (Nov. 20); Rose Farm, Besthorpe, Attleborough; Valley Dale, Hingham Road, Deopham, Wymondham (Nov. 22); Pond Farm, Thrandeston, Diss; Dell Farm, Hingham, Norwich; Hill Farm, Deopham, Wymondham (Nov. 24).

Swine Fever

Bucks. Dibden Hill Farm, Chalfont St. Giles; Thorney Farm, Thorney Mill Road, Iver (Nov. 24).

Cambs. Waldersea Farm, Ringsend, Ely (Nov. 19).

Ches. Churchfield, Church Lane, Neston, Wirral (Nov. 18).

Devon. Within Farm, Aylesbeare, Exeter (Nov. 19); Little Knowle, Brickyards, Bunts Lane, Seaton (Nov. 24).

Essex. Middleton Hall Farm, Middleton, Halstead (Nov. 19); Temple Farm, West Hanningfield, Chelmsford (Nov. 21).

Flints. Nant Bungalow, Rhewl, Mostyn, Holywell (Nov. 18).

Hereford. Hill House Farm, Storridge, Malvern (Nov. 20).

Kent. Camp Site, Langdon Court, East Langdon, Dover (Nov. 19); Little Crampton Farm, High Halden, Ashford (Nov. 24).

Norfolk. White House Farm, Horstead, Norwich (Nov. 18); Wensum Nurseries, Costessey, Norwich (Nov. 19); Athelington Hall, Horham, Diss; Harfreys Road Allotments, Gorleston, Gt. Yarmouth (Nov. 24).

Northants. Lamport Hall, Lamport (Nov. 24).

Suffolk. Mill House Farm, Old Newton, Stowmarket; Glebe Farm, Ringshall, Stowmarket (Nov. 19).

Sussex. Burnt House Farm, Horam (Nov. 24).

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

SCIENTIFIC

Tumour-like Exostosis on the Bones of the Head in Puppies

Sir,—Since January, 1957, there have been referred to this Department 5 West Highland Terrier puppies (4 male and one female), suffering from large tumour-like exostoses related to the bones of the head. In none of these cases was any other abnormality of the skeleton detected. Reliable reports of 2 similar cases, and less reliable reports of several others have been received.

In each of the 5 confirmed cases the first sign of abnormality was evidence of pain or discomfort on opening the mouth, or on masticating food. This was first noticed during the 5th or 6th month of life, and led the owner to suspect teething trouble. Subsequently the rapid enlargement of indurated swellings in the region of the bulla tympanica, and on the mandible, led variously to symptoms of dyspnoea, dysphagia, abnormal articulation of the mandible, or abnormal carriage of the head.

The 5 puppies examined were not from a single breeding kennels, all were reared by different owners, and the pedigrees of no 2 puppies were identical. No dog of any other breed suffering from similar lesions has ever been referred to this Department.

Post-mortem examination, carried out in 4 cases in which the advanced and distressing nature of the disease led to euthanasia, showed that the lesions were proliferative and confined to the petrous temporal and occipital bones, where they averaged 4 cm. in diameter, and the mandibular bones where they were smaller. They consisted of irregular, circumscribed masses of cartilage and cancellous bone. In 3 cases the location of certain of the lesions was bilaterally symmetrical.

Lateral view of the skull of a 7-month-old West Highland Terrier puppy showing exostosis of the petrous temporal and occipital bones, typical of the condition described.

The state of tissue preserved for histological study was, for a variety of reasons, unsatisfactory, but examination of available sections indicated that in one case the lesion was a benign osteoma, and in 3 more they were chondro-myxomata. In one of these latter the appearance of certain areas seems to justify a diagnosis of chondro-myxo-sarcoma, though there was no indication of metastasis, or other macroscopic evidence of malignancy.

It is possible that the variations in histological appearance of specimens taken from different cases may be more apparent than real, due to lack of uniformity in the method of selecting samples of tissue for sectioning.

No evidence was found of any underlying disturbance of calcium metabolism common to the 5 puppies examined.

Reference to the available literature relating to bone tumours in animals (Cotchin, 1951, 1953, 1954, 1956; Feldman, 1932; Mulligan, 1949; Nielsen *et al.* 1954; Schlotthauer, 1934, 1942) indicates that all tumours of the cranial bones in dogs are rare, whilst those of the temporal and occipital bones in particular are very rare indeed. Reports of only 2 cases of the latter kind have been traced (Brossert, 1939, and Fölger, 1917).

Defective development of the occipital bones linked with that of the mandible in dogs has been reported by Tucker (1953), but the lesions he described do not appear to bear any relation to those described above.

The possibility that a defect in nutrition might be concerned in the pathogenesis of the present 5 cases cannot be ruled out on the evidence of so small a series, but differences in the breeding and rearing of the various puppies, coupled with the fact that no more than a single case has so far been recorded in any one litter, do seem to render such an explanation improbable. Indeed the repeated occurrence of such a rare lesion in isolated individuals of a single breed within so short a period, and in the absence of evidence of similar disease in other breeds, seems to favour the possibility that a recessive hereditary factor may cause, or at least predispose, to this bone disturbance. Within the limits of the data presented, this appears to be a specific, and hitherto unrecorded disease entity in dogs. Whether further investigation will substantiate this submission remains to be seen, but it is tentatively proposed that, for the sake of convenience, the descriptive term "cranio-mandibular osteopathy" be applied to the condition.

It may perhaps be significant that, in the 5 cases reported, the proliferative lesions were confined to bones of endochondral origin, and the mandible, which though of membranous origin, has as its embryonic precursor Meckel's cartilage (M'Fadyean, 1953). These 5 cases have certain features in common with diaphyseal aclasis (hereditary multiple exostoses) in man, among them this predilection for bones of endochondral origin, and the appearance of lesions at a very early age, before active skeletal growth has ended. Whether this resemblance is purely coincidental or is the result of some factor common to the pathogenesis of both conditions is a matter upon which it would not be safe to speculate

at the present stage. No case of diaphyseal aclasis has ever been reported in animals (Cotchin, 1953).

This preliminary note has been prepared in the hope that further cases presented to veterinary surgeons will be readily recognised, and whenever possible referred to this Department for investigation. A more detailed account will be published at a later date.

In conclusion I would like to express my thanks to Mrs. H. M. E. Denham, and Messrs. S. A. Craig, J. M. Peacock, and T. F. Tunney, M'S.R.C.V.S., for referring to me the cases described; to my colleagues on the staff of this Department, and on that of the Department of Animal Pathology for their co-operation and advice in handling clinical and pathological material from these cases; and finally to Mr. I. A. Silver of the Department of Anatomy and Dr. D. B. Cater of the Department of Pathology for advice on the interpretation of the histological sections.

Yours faithfully,
M. C. G. LITTLEWORT.

Department of Veterinary Clinical Studies,
School of Veterinary Medicine,
Madingley Road,
Cambridge.

November 11th, 1958

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Use of X-irradiated Larvae for Immunisation of Calves

Sir,—We have previously demonstrated that it is possible to produce artificial immunity to *Dictyocaulus viviparus* infections in calves by administering a single dose of X-irradiated infective larvae. A much higher degree of protection is induced by giving two doses of irradiated larvae at approximately one month's interval. Groups of 10 calves were used, both vaccinates and controls being challenged with 10,000 infective larvae. At autopsy the lungs of the vaccinates were normal while those of the controls showed about 75 per cent. consolidation. The bronchi of the controls contained a mean of 900 adult worms and many immature forms; no worms were found in any of 30 vaccinated calves.

This study has been extended to gastro-intestinal worms. Five groups of 7 sheep were given 10,000 infective larvae of *Haemonchus contortus* irradiated with 10,000, 20,000, 40,000, 60,000, and 100,000 roentgens, respectively. These groups, with a control group of the same age, were challenged with 8,000 normal larvae and the respective abomasal mean group worm burdens were 5, 0, 200, 0, 442; the mean take in the control group was 2,042. The effect of a second vaccinating dose is being studied at present.

This demonstrates that this method of making vaccines might be profitably applied to parasites with a minimal migratory cycle.

Yours faithfully,
W. F. H. JARRETT.
F. W. JENNINGS.
W. I. M. McINTYRE.
W. MULLIGAN.
N. C. C. SHARP.

University of Glasgow Veterinary School,
Veterinary Hospital,
Bearsden Road,
Bearsden, Glasgow.

November 7th, 1958

GENERAL

V.V.B.F. Christmas Appeal

Sir,—It is customary at this time of the year to remind readers of the Christmas Gift Account from which we are enabled to give our less fortunate brethren or their widows (some with children) a monetary gift so that they too may be able to enjoy a happy Christmas.

May we, therefore, ask all who read this appeal to kindly show their interest in, and support of, this good work, by sending at an early date a donation, however small, to the Secretary, V.V.B.F., 10 Red Lion Square, London, W.C.1.

If, on the other hand, any reader would prefer to send a special Christmas parcel to one of the Fund's recipients, the address will gladly be supplied.

Yours faithfully,
H. W. DAWES.
(*President*),
J. McCUNN.
(*Hon. Treasurer*),
J. J. DUNLOP,
(*Hon. Secretary*).

10, Red Lion Square,
London, W.C.1.
November 18th, 1958

Clinical Reporting of Animal Experiments

Sir,—In his letter of November 15th, Mr. F. B. Leech draws attention to some examples of errors of scientific reporting in recent veterinary literature, and this prompts the observation that some recent communications in THE VETERINARY RECORD are also at fault in this respect. In the same issue there is a reference to the use (in unspecified dosages) of preparations recognisable only by their commercial names, and without any mention of the pharmaceutical descriptions. In a less recent issue during the description of the treatment of a much publicised case of leucaemia in a dog there is a reference to the use of a Vitamin B 12 preparation described as "iron-dextran" (*sic*). In this instance the trade

name applied to the preparation was even ascribed to the wrong commercial firm.

Reference to drugs should surely be first to their chemical or pharmaceutical names and secondly to their proprietary title. One would also expect that both would be named correctly. Such is the custom, if not the rule, in contemporary scientific journals, and we should expect no less in THE VETERINARY RECORD. In addition, one often sees an account of a drug given in "large doses." Such phrases are meaningless unless qualified by some estimate, at least, of the dose administered. As Mr. Leech points out, what may be clear in the journal of to-day may be a quite inadequate "clue" in 50 years' time, and we should attempt to minimise the sources of confusion wherever possible by correct and precise references to pharmaceutical preparations.

The British veterinary profession may be judged to some extent by the quality of the literature in the official journal of the B.V.A., and if carelessness of the type exemplified is permitted we can expect unfavourable reflections on the profession now, and possible confusion in the future. At a time when so much thought and correspondence is devoted to the status and prestige of the profession this is surely worthy of a little consideration.

Yours faithfully,
D. F. KELLY,
D. B. ROSS.

4, Chesterton Hall Crescent,
Cambridge.
November 17th, 1958

The R.C.V.S. and the B.V.A.

Sir,—Mr. Anderson naïvely asks in THE VETERINARY RECORD of November 15th, "Does he (the veterinary surgeon) believe that the position of the doctor in this country is better than that of the veterinary surgeon?" I expect that this is a rhetorical question and, in his ignorance of the conditions prevailing in some branches of the profession, he expects the answer to be in the negative. I cannot speak for the members of the veterinary profession engaged in general practice, apart from mentioning that the average salary of a medical practitioner to-day is £2,300 per annum, plus a 4 per cent. increase granted this week, but I can say a little about the position of veterinary teachers in some of our universities, where the answer to Mr. Anderson's question is most emphatically in the positive. Veterinary teachers are worse off, in some cases considerably worse off, than their opposite numbers in the medical profession.

Perhaps it would be of interest to note the belief of the British Medical Council with respect to other professions. "The council does not dispute that there are other men and women who have long and difficult courses of preparation, long hours of continuous duty and heavy responsibility. It firmly believes, however, that no other group shares with the doctor, particularly the general practitioner, all the burdens which the practice of medicine entails continuously throughout the doctor's working life, and in which his family is usually involved."

The medical profession accepts this and some universities also accept it, since the value they place on a person is reflected in the salary they pay. For similar grades in the university a medical qualification carries a higher salary, and there are cases, some very recent, actually advertised in THE VETERINARY RECORD, where medically qualified people have been offered higher remuneration to teach veterinary students veterinary subjects, than would have been available for a suitably qualified veterinarian. Since I know of nothing which has been done, or said, by either the B.V.A. or R.C.V.S., in the more immediate past, to raise the financial status of veterinary teachers to that of the medical teachers, I can only assume that these bodies are in total agreement with the British Medical Association and the universities, and that in their opinion, the veterinary teachers are being satisfactorily paid.

I may be wrong, and if so I should be genuinely interested to hear from Mr. Anderson or from any members of the B.V.A. or R.C.V.S. their opinion of the matter, whether any steps have been taken to remedy the position, and the progress, if any, made.

Yours faithfully,
J. M. HAMILTON.

9, Howgate,
Kilwinning,
Ayrshire.
November 21st, 1958

Sir,—May I be permitted to comment on Mr. Anderson's communication which I assume he deemed to be an adequate answer to my last letter? Mr. Anderson airily dismissed my criticism as unconstructive. His following remarks gave the impression that all's right in the veterinary world. If he really believes this, then he is hopelessly out of touch with current feeling. The substance of his letter does him credit in a literary sense only.

The essence of my argument was that, as veterinary surgeons, we have no effective organisation willing or able to protect and improve the lot of the majority, *i.e.* the employed as opposed to the self-employed. The key word is *effective*. I am asked to read the procedure of the B.V.A. in 1947 and 1948 when that body fought for better conditions for Government staff. I would ask Mr. Anderson what was the result? Worsening conditions in the ensuing 10 years do not suggest success by the B.V.A.

Again, I am asked if I really think that status overseas is higher than at home—obviously I do or I would not have said so. The same answer applies to emigration: in the past 24 months, I have personally known, in my small sphere, 7 members who have taken posts overseas. Each one was heartily fed up with conditions here both in practice and in public service. Their subsequent letters to me express rather different views from those of Mr. Anderson in the respect of status overseas.

I neither know nor care how many doctors apply for one job—my commendation for the B.M.A. was for the unity among its members (despite public outcry) in opposing certain anomalies. Mr. Anderson talks of democratic systems, etc. This, I suppose, is in keeping with our receipt of short lists of candi-

dates for particular councils. We are requested to cast votes for people unknown to us and whose views are equally unknown. Nations are said to get the Governments they deserve—perhaps the same goes for us within the profession! The present structure of the B.V.A. is too staid, too archaic to grapple effectively with conditions in this high powered sales-talk age.

In conclusion may I state, quite humbly, that the sole object of my letters is to stimulate activity among as many members of our profession as possible—with, I hope, a view to the formation of a more streamlined organisation which has a true capacity for effective action in all spheres.

Yours faithfully,
DONALD BASINGER.

" Dutch Cottage,"
Cold Norton,
Nr. Chelmsford, Essex.
November 17th, 1958

" Tranquillisers " for Shows

Sir,—May I join the ranks of those who deprecate the use of tranquillisers for dogs for the Show ring?

Dog shows are the shop window, both for export and for breeders of potential stock. Some breeds have already lost favour through bad temperament; how, therefore, is a potential sire, or dam, to be selected if the animals on show are tranquillised?

We have stopped the showing of monorchids and cryptorchids, but surely we should not encourage the breeding of highly nervous or vicious stock by providing tablets to mask these tendencies? That these tablets can be obtained from other sources is no excuse for giving our professional blessing to their use for showing.

Yours faithfully,
MARGARET E. M. WILSON.

Rest Harrow,
Uplyme,
Lyme Regis, Dorset.
November 24th, 1958

" Approved " Veterinary Surgeons

Sir,—By the blessing of God, and the fact that I am a small-animal practitioner, I have little contact with Government departments apart from the generally accepted inconvenience of the intervention of the Inland Revenue.

Unfortunately, I have this week been faced with some official documents which have somewhat raised my, normally quite average, blood pressure. It appears from them that the Ministry of Agriculture (even through the Department for Scotland) actually " approves " of certain veterinary surgeons for certain services—which implies disapproval of others.

Since, at the present day, we must labour under the ever-commanding rules of the Civil Service, I take it that we must put up with certain regulations. If, however, the Ministry (for which we all pay) would, at least " appoint " veterinary surgeons to a particular task it would lower blood pressure and reassure us that a little discretion and politeness still exists amongst our " obedient servants."

Personally I object to being a disapproved veterinary surgeon.

Yours faithfully,
MILLER WATSON.

11, Annfield Place,
Glasgow, E.1.
November 22nd, 1958

Accidents Associated with Anaesthesia

Sir,—The observations of such an authority as Dr. Brook on the subject of epidural analgesia are of very great interest to all who employ this method of nerve block. Because of his request for information concerning the complications associated with this form of analgesia in sheep I would like, through the courtesy of your columns, to outline our recent experiences with the use of this technique in these animals.

Since the beginning of 1957 3 anaesthetists have attempted to perform epidural nerve blocks by injection through the lumbo-sacral space in 34 sheep. The procedure was carried out with strict aseptic precautions while the animal was restrained on the operating table in left lateral recumbency with full flexion of the lumbo-sacral region. By accident, in 9 of the sheep the subarachnoid space was entered and in these animals a subarachnoid or " true spinal " block was performed, while in the remaining 25 sheep a successful epidural block was achieved.

For epidural block 2.0 per cent. lignocaine hydrochloride solution (Duncan and Flockhart) was mixed with 0.9 per cent. sodium chloride solution to give a final concentration of 1.5 per cent. lignocaine hydrochloride, and 0.15 ml. of 1 :1000 adrenaline (B.D.H. Ltd.) was added to every 30 ml. of this solution. For " true spinal " blocks a hyperbaric solution of cinchocaine (" Heavy Nupercaine," Ciba) was used. The solutions were at room temperature when they were injected through the spinal needle.

The sheep usually moved when the spinal needle penetrated the interarcuate ligament and this movement was the principal cause of the needle entering the subarachnoid space. Injection of the local analgesic into the subarachnoid space provoked no obvious response from the sheep but even very slow injection (1 ml. in 6 seconds) into the epidural space produced transitory signs of discomfort. Two sheep in which rapid injections were made into the epidural space appeared to lose consciousness and showed widespread muscular rigidity but they recovered within a very short space of time without any treatment being given.

In all 34 sheep analgesia has been induced at least to the level of the mid-thoracic region. This has necessitated the injection into the epidural space of between 8 and 15 ml. of the lignocaine solution, depending on the size of the animal. The subarachnoid blocks have been produced by the injection of 2 ml. of " Heavy Nupercaine " followed by careful posturing of the animal.

With the exception of one animal all the sheep subjected to epidural block were able to walk about within 4 hours from the time of injection. The one exception was a ewe which was subjected to a caesarean hysterotomy; this animal was a very poor

operation risk. She was passing very fluid faeces when admitted to the hospital and on the day after operation she was unable to stand although both sensation and motor power were present in her hind legs. On the next day she was able to stand and walk but she continued to scour and became progressively weaker until she died on the fourth day after operation. All the 9 animals subjected to subarachnoid block were able to stand and walk within 6 to 7 hours from the time of injection. Thus, in this admittedly very small series of cases, we have not encountered a single case of persistent paralysis of the hind limbs. As additional evidence for the safety of the techniques described we have records of one ram (not included in the above series) which was subjected to 3 epidural blocks and one subarachnoid block without any untoward sequelae.

Yours faithfully,
L. W. HALL.

Department of Veterinary Clinical Studies,
School of Veterinary Medicine,
Madingley Road,
Cambridge.
November 18th, 1958

Sir,—Having obtained much of my knowledge on spinal anaesthesia from the original work of Dr. Brook I am hesitant to answer the correspondence in which he refers to accidents associated with epidural anaesthesia. I, however, have some 30 years' experience of the method and can claim a fair knowledge of the troubles that result from its use.

To-day I am forced to conclude that if consistent results are to be obtained with spinal nerve block by injection at the lumbo-sacral space the following points must be appreciated.

It is virtually impossible to ensure that the spinal injection is made into the epidural space unless a test for negative pressure confirms that the point of the needle is so situated. Without such a test a high percentage of such injections are subdural (into the subarachnoid space to mix with cerebro-spinal fluid).

With this fact in mind it is essential that, if the test is to be ignored (which is my practice), the dose of anaesthetic be kept within the limits of subdural anaesthesia—a much smaller dose than the top limit for epidural anaesthesia.

Further, with the fact in mind that the injection is frequently subdural, it is important, particularly if a full dose is to be given, that the solution is hyperbaric (higher sp.gr. than cerebro-spinal fluid) otherwise the anaesthetic may travel forward with fatal results.

The technique I adopt is to use 5 per cent. procaine diluted equal parts with 5 or 6 per cent. glucose, and in dogs and cats I inject 1 c.c. for every 10 lb. bodyweight. The fore part of the animal should be kept higher than the hindquarters.

With the exception of a very rare collapse and death with caesarean section, I have experienced no permanent ill effects in any animal including sheep.

Unless the spaniel referred to by Dr. Brook was exceptionally large it seems to me that it was given considerably more anaesthetic than required; and if this was given in a hypobaric solution (standard with most manufacturers) in my opinion it would account for death.

Full details of the technique and methods I employ will be published in the annual congress report of the *British Small Animals Veterinary Association*.

I take this opportunity to express to Dr. Hall my appreciation for another valuable contribution to our knowledge of veterinary anaesthesia.

Yours faithfully,
J. SPREULL.

78, Ward Road,
Dundee.
November 20th, 1958

Destruction of Game in Africa

Sir,—In this year of grace—or should it be disgrace?—it is distressing to be reminded by the letter of Dr. A. M. Harthoorn in your issue of November 15th, that in parts of Africa the senseless destruction of our wild game heritage continues unabated. In this atomic age man still appears to be motivated by a primitive blood lust and apparently welcomes any excuse to kill.

So many spectacular advances have been, and will no doubt continue to be, made in the chemotherapeutic control of disease, not to mention parallel advances in insecticides, that there appears to be no excuse for this primitive, outmoded and unscientific approach to trypanosomiasis control. In some parts of Africa it is possible that the tsetse fly may be a blessing in disguise; by preventing stocking or overstocking and consequent erosion, many areas are prevented from becoming deserts. Far too many de-afforested and eroded areas in East Africa stand as mute witnesses to man's ignorance and stupidity.

Scipio Africanus once said "*ex Africa semper aliquid novi*"; this continued game destruction suggests that he is wrong and that in trypanosomiasis control there is nothing new.

Yours faithfully,
R. C. U. FISHER.

Charmwood,
Farnborough, Kent.
November 19th, 1958

Distemper Complex

Sir,—I hope that Mr. Hodgman's letter will provoke the response he seeks. It would seem that he fears that all is not well in the field of anti-distemper vaccination. For my own part the success of present methods has been astounding and I have had results from the use of egg adapted virus (Epivax) over the last few years that I could never have believed possible, as the Table overleaf will show.

I have always been a protagonist of the living virus, even before the avianised product was put on the market. It surely has never been held that the age of a dog is any guarantee of immunity? Certainly old dogs will be susceptible if they have not recovered from the disease nor been efficiently vaccinated, and in my opinion every dog which leads a normal dog's life, and meets its fellows, will

continue to remain immune after certain immunisation. Further, that immunity will be to both typical distemper and so called "hard pad" disease.

My experience has been almost entirely with Greyhounds, but it has meant that I have had a very wide experience and a very strict control over many dogs from birth to death.

Over a period of more than 25 years I have been in charge of a kennel strength of over 600 Greyhounds (rather less in war time), plus a yearly intake of approximately 1,200 dogs and a similar number going out. Involved in these figures are a number of ownbred puppies which are immunised, reared and raced, and mainly disposed of as over age or otherwise useless. Some, male and female, are retained for breeding purposes.

Until the advent of egg adapted virus, my lowest figure of distemper cases in any one year was 71 in 1950. The highest was in 1947 and was 209 cases.

It was my fortune to have some of the earliest experimental egg adapted virus, but it was disappointing in that only 40 per cent. of vaccinated dogs proved to be immune. It was with some scepticism that I went in for the marketed product "Epivax," but I was encouraged (a) by the successful use of a small batch of like material from New Haw, thanks to Messrs. Hudson and Mansi; (b) by assurances from Burroughs, Wellcome and Co., that technique had improved and (c) by the certain knowledge that I was getting nowhere by other methods.

The transformation has been complete so far, whatever the future may hold. I have vaccinated the puppies shown below at an average age of between 8 weeks 3 days and 10 weeks 1 day. All are revaccinated at approximately 15 to 16 months.

Other dogs which enter the kennels are vaccinated on entry without previous isolation. I do this on the assumption that if "Epivax" may be used for distemper *treatment* with impunity, I need not fear its use as an indicriminate method of immunisation. Over nearly 5 years that risk has been amply justified. The Table of vaccinations shows:—

Year	*Puppies*	*Saplings*	*New entry adults (doubtful history of vaccination).*
1954	47	13 (M. of A.)	30
1955	258	96	65
1956	281	270	83
1957	216	286	107
1958	129	235	168

In the period covered by the Table above, with the exceptions hereafter, no puppy, sapling or adult has ever shown a sign of distemper or so called "hard pad" disease.

There has been *one* single case of distemper and that in an unvaccinated dog called "Alabama" which succumbed to the disease and did not infect any other dog. One bitch suspected of harbouring distemper on entry was given "Epivax" and was destroyed suffering from chorea, 5 weeks later, the only neurological case on the premises over these years.

These constitute the sole casualties in the 5-year period, surely an astonishing record and one of which the manufacturers must be very proud—as Greyhound owners undoubtedly are.

On our premises now we have some 12 stud dogs from 7 to 12 years of age, and over 40 bitches of varying ages.

It is always possible, one supposes, that something may go wrong in the production of the egg adapted virus, that the virus may die or lose its virulence for different reasons and in different batches, but whatever the future may hold, I pen these results with pleasure and regard them as one hundred per cent.

May the methods remain foolproof, and the virus remain controlled and alive. I am not without belief that there even may be great advantage in the fact that the egg adapted virus is alive, for I know that there were gaps in my programme in 1954-55. Distemper disappeared as if by magic before all dogs were treated, and since some still susceptible dogs avoided the disease for life, it seemed just possible that this state was attributable perhaps to contact with their treated fellows. I have no proof of this and merely hazard the guess.

Yours faithfully,
JAS. K. BATEMAN.

The Hook Kennels,
Northaw,
Potters Bar, Middlesex.
November 24th, 1958

We are asked by Mr. S. F. J. Hodgman to make a correction in the text of his last week's letter on the subject above. In the paragraph beginning, "From the purely clinical point of view" the word "nervous" had been used inadvertently. The paragraph should continue "the manifestations so frequently seen" etc. not the "*nervous* manifestations."

A Suggested New Feature

Sir,—Mr. J. N. Wright has taken Mr. E. F. Peck to task for suggesting the publication of unscientific articles. He is apparently very young and still suffering under the lash of that old bogey "the practical man." Let me assure him that that old gentleman was at large, in their youth, to scourge even the oldest members of the R.C.V.S.

I will not labour the obvious truth that very much useful and potentially fruitful information, the result of observation by men with a sound professional training, not "ignorant of what is known and of what can be observed," is not published. I would remind him of the great William Ostler's words to his medical class after their graduation, and bursting with the knowledge of all that they had learnt, "Gentlemen, let me tell you, one fine day soon some old woman, in a red-flannel petticoat, will tell you something *you* don't know."

Yours faithfully,
G. S. MUIR.

1, Cedar Hill,
Newport, I.W.
November 23rd, 1958